CLASS:MTech   **SEMESTER : II**
BRANCH: SER   **SESSION : SP/22**

SUBJECT: Heat Transfer in Space Applications (SR555)

TIME: 2:00-
4:00 PM   **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.

Q.1(a)	Interpret the significance of "displacement" in Wien's displacement law. (BT Level: 4, CO: 1)	[5]
Q.1(b)	Briefly describe the budget of radiation heat flux directed towards a body with the help of equations. (BT Level: 4, CO: 1)	[5]
Q.2(a)	Provide a guideline diagram for assessing the importance of different planets as probable sources of thermal loads for a spacecraft orbiting near the Earth. (BT Level: 3, CO: 2)	[5]
Q.2(b)	Clearly demonstrate the differences among design, acceptance, and qualification temperature ranges for an IC based component used inside a spacecraft. (BT Level: 4, CO: 2)	[5]
Q.3(a)	Explain the design concept of a MLI and provide outline of a suitable thermal analysis. (BT Level: 4, CO: 3)	[5]
Q.3(b)	Analyze the thermal problem associated with a spacecraft operating in an orbit near the Earth during the phase in which it is in the shadow region. (BT Level: 4, CO: 3)	[5]
Q.4(a)	Derive an equation for tracking the skin temperature of a spacecraft subjected to aerodynamic heating during the ballistic entry into Earth's atmosphere. (BT Level: 5, CO: 4)	[5]
Q.4(b)	Describe the role of drag in designing the shape of a spacecraft on the side of direct contact with atmospheric air. (BT Level: 3, CO: 4)	[5]
Q.5(a)	Sketch the working principle of a cryocooler and compare with the CCA cryocooler used in the James Webb telescope. (BT Level: 3, CO: 5)	[5]
Q.5(b)	Estimate the mass of PCM and radiator surface area for a pulsing PCB circuitry cooling problem. (BT Level: 3, CO: 5)	[5]

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